

# **Spot Safety Project Evaluation**

Work Order #41000004907

Spot Safety Project # 13-02-213

**Spot Safety Project Evaluation of the Traffic Signal Installation at the Intersection of  
US 74A (Charlotte) and SR 3136 (Cane Creek Rd)  
Buncombe County**

Documents Prepared By:

Safety Evaluation Group  
Traffic Safety Systems Management Section  
Transportation Mobility and Safety Division  
North Carolina Department of Transportation

**Principal Investigator**



Brad Robinson, PE

3/4/2010

Date

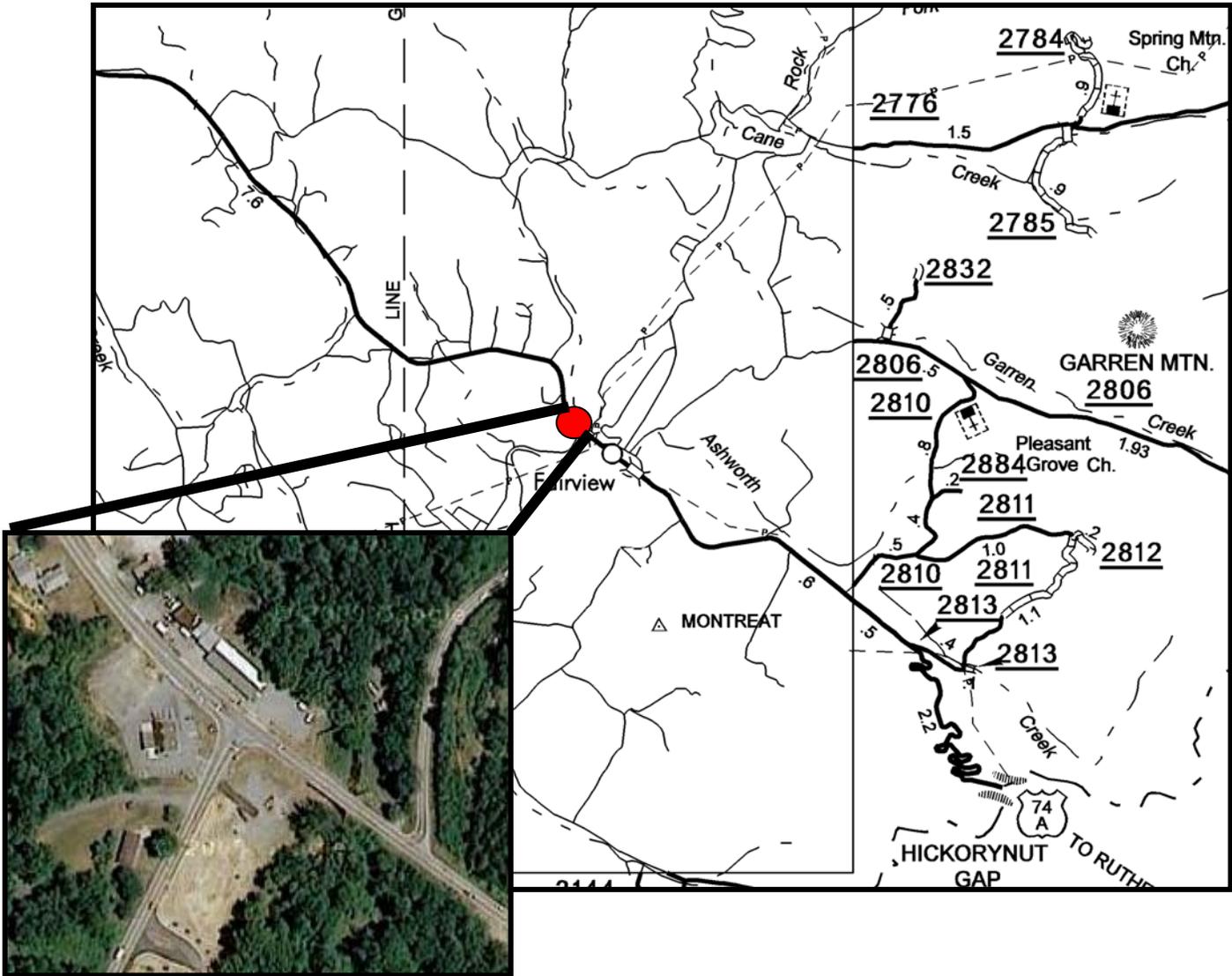
Traffic Safety Project Engineer

# Spot Safety Project Evaluation Documentation

## Subject Location

Evaluation of Spot Safety Project Number 13-02-213 – The Intersection of US 74A (Charlotte) and SR 3136 (Cane Creek) in Buncombe County

The signal number for this location is 013-0876.



## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was to install a traffic signal.

The subject location is a four-leg intersection with a commercial driveway as the fourth leg. The intersection was controlled by stop conditions on SR 3136 and the driveway in the before period. Southbound US 74A has a through-left lane and an exclusive right turn lane. The other two approaches are single lane. All legs (with the exception of the driveway) have 45 mph speed limits. The right turn lane on US 74A southbound was constructed sometime in 2001.

The original statement of problem was that there was side street delay on SR 3136.

The initial crash analysis was conducted from November 1, 1998 to October 31, 2001 with no reported crashes. The final completion date for the improvements at the subject intersection was on September 17, 2003 with a total cost of \$50,000.00.

## Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from August 1, 2003 to October 31, 2003. The before period consisted of reported crashes from August 1, 2001 through July 31, 2003 (2 years) and the after period consisted of reported crashes from November 1, 2003 through December 31, 2009 (6 years and 2 months). The beginning date for this analysis was limited by the construction of the right turn lane on US 74A, as mentioned in the *Project Background* section. The ending date was limited by the available crash data at the time the analysis was conducted. Please note that the before and after time frames are different. For this reason the analysis was conducted on a per-year basis.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact crash types were the Target Crashes for the applied countermeasure. These crash types are considered as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

<b>Treatment Information</b>	<b>Before (2 Years)</b>	<b>After (6.17 Years)</b>	<b>Percent Reduction (-) Percent Increase (+)</b>
Total Crashes	17	17	
<b>Total Crashes Per Year</b>	8.5	2.76	-67.5
Total Severity Index	4.05	8.94	120.7
Target Crashes	12	8	
<b>Target Crashes Per Year</b>	6	1.3	-78.3
Target Crash Severity Index	3.47	13.25	281.8

Volume	11,900	13,500	13.4
<b>Target Crash Severity Summary (By Year)</b>			
Fatal Crashes Per Year	0	0.00	N/A
Class A Crashes Per Year	0	0.16	N/A
Class B Crashes Per Year	0	0.16	N/A
Class C Crashes Per Year	2	0.32	-84.0
PDO Crashes Per Year	4	0.65	-83.8

The naive before and after analysis at the treatment location resulted in a 68 percent decrease in Total Crashes per year, a 78 percent decrease in Target Crashes per year, and a 13 percent increase in Average Daily Traffic (ADT). The before period ADT year was 2002 and the after period ADT year was 2006.

## Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 68 percent decrease in Total Crashes per year and a 78 percent decrease in Target Crashes per year. The Total Severity Index increased by 120 percent and the Target Severity Index increased by 282 percent. The summary results above demonstrate that both Total and Target Crashes appear to have decreased at the intersection from the before to the after period.

The calculated benefit to cost ratio for this project is -4.10 considering total crashes. The benefit to cost ratio considering only target crashes is also -5.58. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

It appears that the signal installation was very effective at reducing Target Crashes at the subject intersection. When looking at the intersection on a per-year basis, the intersection experienced a 78 percent reduction in Target Crashes. There was a single "A" injury Left Turn-Same Roadway Crash in the after period that contributed to the high increase in the severity indexes and the negative benefit to cost ratios.

There were five Left Turn-Same Roadway Crashes in the after period. This pattern made up 63 percent of the Target Crashes. The left turning vehicle was faulted for failure to yield in all five of these crashes.

Please see the attached *Treatment Site Photos*. Photos were obtained from Google Street-view. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: US 74A at SR 3136  
 COUNTY: Buncombe  
 FILE NO.: SS 13-02-213

BY: bdr  
 DATE: 3/3/2010

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$50,000	10	0.149	\$7,451
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$50,000</b>	<b>10</b>	<b>0.149</b>	<b>\$7,451</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$2,000  
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$900  
 TOTAL ANNUAL COST= \$10,351  
 TOTAL COST OF PROJECT= \$50,000

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	2.00	0	0.00	7	3.50	10	5.00	\$91,000
AFTER	6.17	1	0.16	8	1.30	8	1.30	\$133,485

Annual Benefits from Crash Cost Savings (\$42,485)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$52,836)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -4.10

TOTAL COST OF PROJECT - \$50,000 COMPREHENSIVE B/C RATIO - -4.10

**BENEFIT-COST ANALYSIS WORKSHEET**

LOCATION: US 74A at SR 3136  
 COUNTY: Buncombe  
 FILE NO.: SS 13-02-213 Target Crashes Only

BY: bdr  
 DATE: 3/3/2010

DETAILED COST: TYPE IMPROVEMENT - Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
	\$50,000	10	0.149	\$7,451
Right-of-Way	\$0	0	0.000	\$0
<b>TOTALS</b>	<b>\$50,000</b>	<b>10</b>	<b>0.149</b>	<b>\$7,451</b>

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
<b>TOTAL ANNUAL COST=</b>	<b>\$10,351</b>
<b>TOTAL COST OF PROJECT=</b>	<b>\$50,000</b>

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	2.00	0	0.00	4	2.00	8	4.00	\$56,800
AFTER	6.17	1	0.16	3	0.49	4	0.65	\$114,554

Annual Benefits from Crash Cost Savings (\$57,754)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$68,106)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -5.58

TOTAL COST OF PROJECT - \$50,000 COMPREHENSIVE B/C RATIO - -5.58

**Site Photos from Google Street-View**



**Looking northwest on US 74A**



**Looking southeast on US 74A**



**Looking northeast from SR 3136 (Cane Creek Rd)**

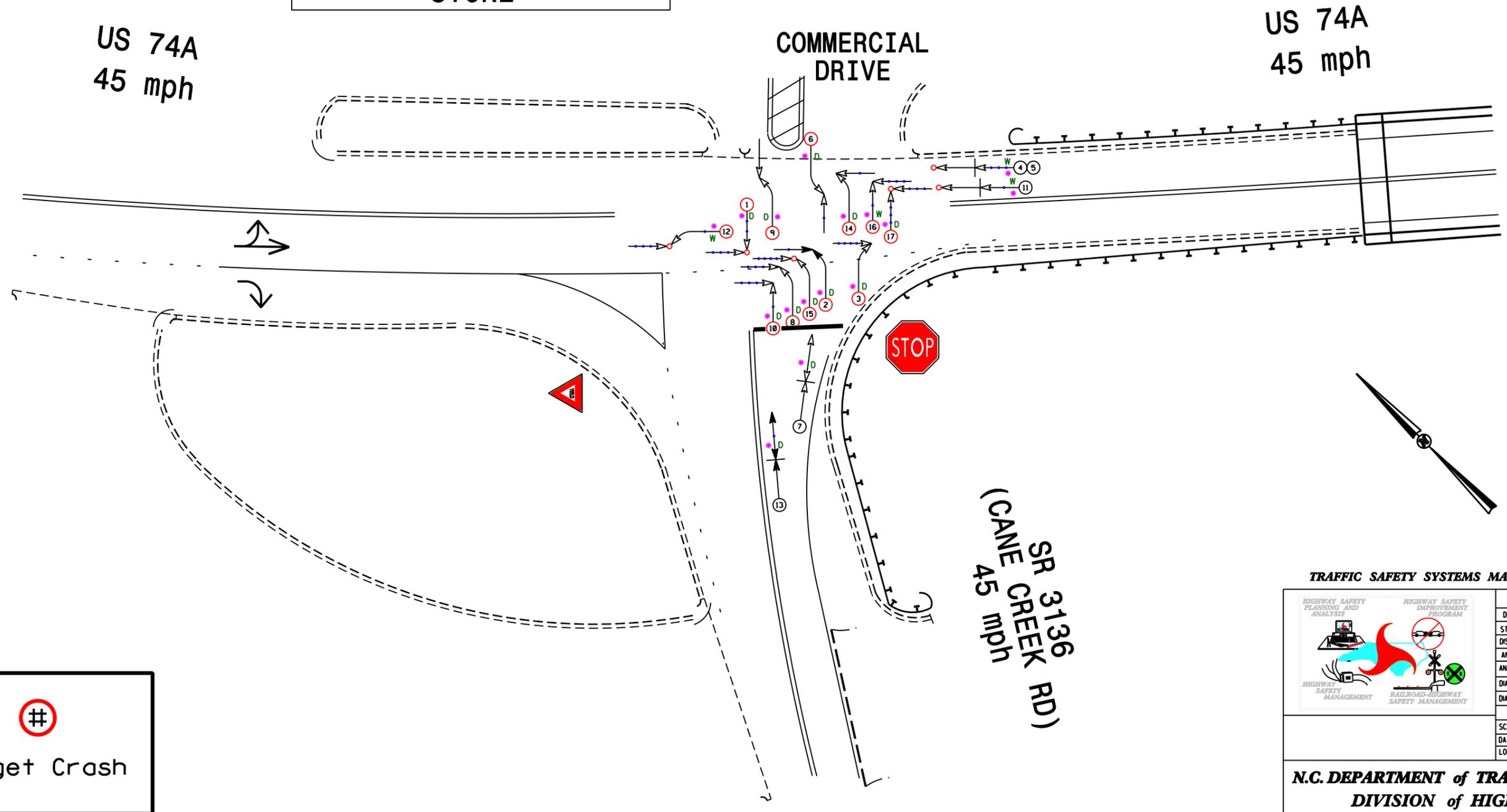
Buncombe County  
 US 74A (Charlotte) and  
 SR 3136 (Cane Creek)  
 BEFORE Period  
 8/1/2001-7/31/2003  
 (2 YEARS)

NOTE: TIME PERIODS FOR BEFORE AND AFTER PERIODS ARE DIFFERENT  
 (2 Years vs 6.17 Years)

FAIRVIEW  
 GENERAL  
 STORE

**LEGEND**

MOVING VEHICLE	ANGLE	9 MPH OR LESS	P PEDESTRIAN
PEDESTRIAN	TURNING	10 MPH TO 19	T TRAIN
PARKED VEHICLE	BACKING	20 MPH TO 29	* DRIVER AT FAULT
PARKING VEHICLE	SIDESWIPE	30 MPH TO 39	D DRY
FIXED OBJECT	OUT OF CONTROL	40 MPH TO 49	W WET
HEAD ON	INJURY	50 MPH TO 59	I ICY OR SNOWY
REAR END	FATALITY	60 MPH TO 69	O OILY
RAN OFF ROAD		70 AND UP	
		SPEED UNKNOWN	



#  
 Target Crash

**TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT**

	COLLISION DIAGRAM	
	DIVISION: 5	AREA:
	STUDY PERIOD: 8/1/2001-7/31/2003	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: March 2004		
LOG NUMBER: 4000004907		

**N.C. DEPARTMENT of TRANSPORTATION**  
**DIVISION of HIGHWAYS**  
**TRANSPORTATION MOBILITY AND**  
**SAFETY DIVISION**

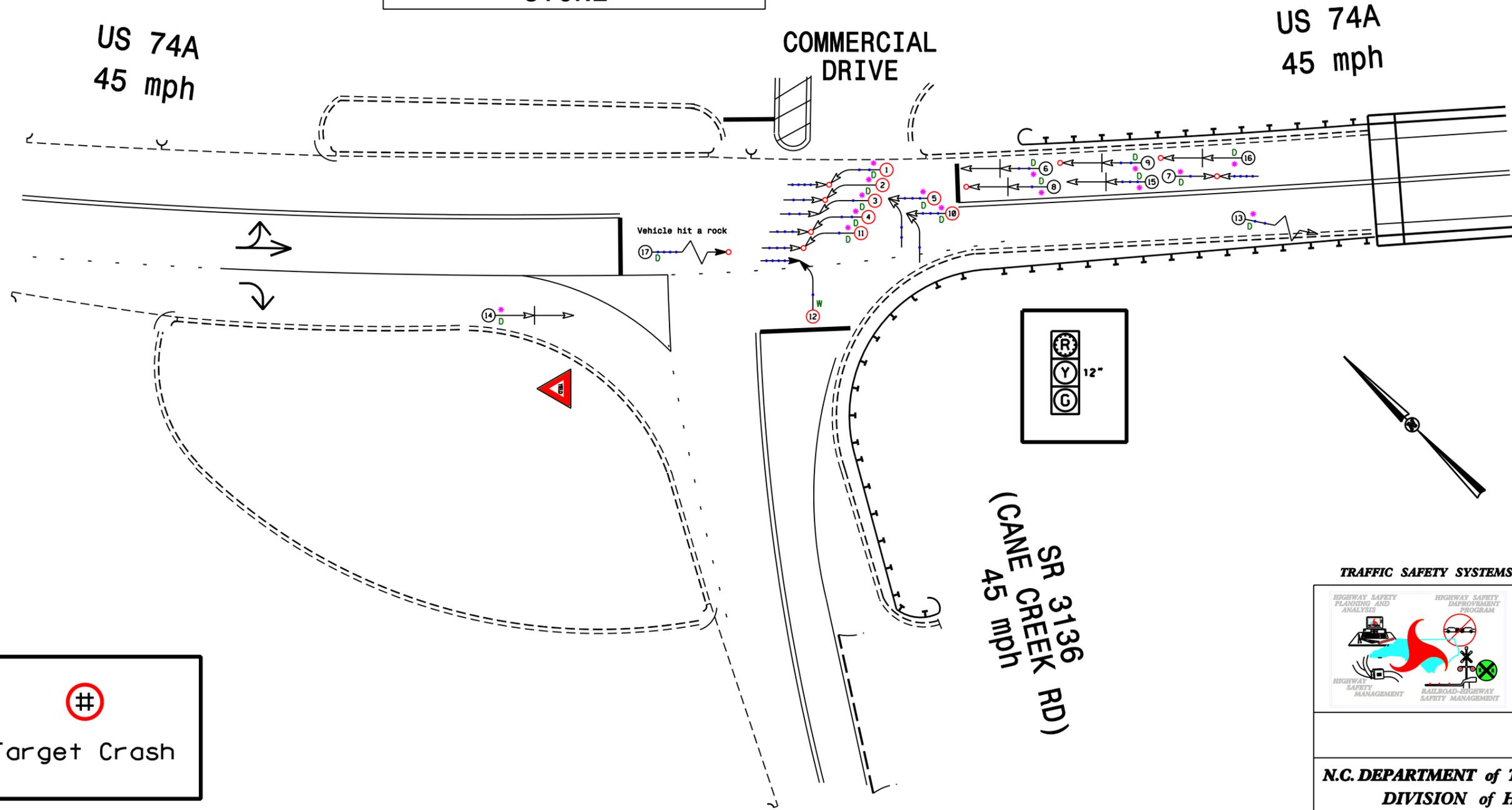
Buncombe County  
 US 74A (Charlotte) and  
 SR 3136 (Cane Creek)  
 AFTER Period  
 11/1/2003-12/31/2009  
 (6 YEARS, 2 MONTHS)

NOTE: TIME PERIODS FOR BEFORE AND AFTER PERIODS ARE DIFFERENT  
 (2 Years vs 6.17 Years)

LEGEND

MOVING VEHICLE	ANGLE	9 MPH OR LESS	P PEDESTRIAN
PARKED VEHICLE	TURNING	10 MPH TO 19	T TRAIN
PARKING VEHICLE	BACKING	20 MPH TO 29	* DRIVER AT FAULT
FIXED OBJECT	SIDESWIPE	30 MPH TO 39	D DRY
RAN OFF ROAD	OUT OF CONTROL	40 MPH TO 49	W WET
	INJURY	50 MPH TO 59	I ICY OR SNOWY
	FATALITY	60 MPH TO 69	O OILY
		70 AND UP	
		SPEED UNKNOWN	

FAIRVIEW  
 GENERAL  
 STORE



#  
 Target Crash

SR 3136  
 (CANE CREEK RD)  
 45 mph

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

	COLLISION DIAGRAM	
	DIVISION: 5	AREA:
	STUDY PERIOD: 11/1/2003-12/31/2009	
	DISTANCE: Y-LINE = 150 FT	
	ANALYSIS PREPARED BY: BDR	
ANALYSIS CHECKED BY:		
DIAGRAM PREPARED BY: BDR		
DIAGRAM REVIEWED BY:		
SCALE: NOT TO SCALE		
DATE: March 2010		
LOG NUMBER: 4000004907		

N.C. DEPARTMENT of TRANSPORTATION  
 DIVISION of HIGHWAYS  
 TRANSPORTATION MOBILITY AND  
 SAFETY DIVISION